MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

PCF0145 – CELL AND FUNCTION

(Foundation in Life Sciences)

17 OCTOBER 2018
2.30 p.m - 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of **8** printed pages excluding the cover page with **5** structured questions.
2. Answer **ALL** questions.
3. Distribution of marks for each section/question is given.

STRUCTURED QUESTIONS [50 MARKS]

Instructions: Answer **ALL** questions. Write your answers in the Answer Booklet.

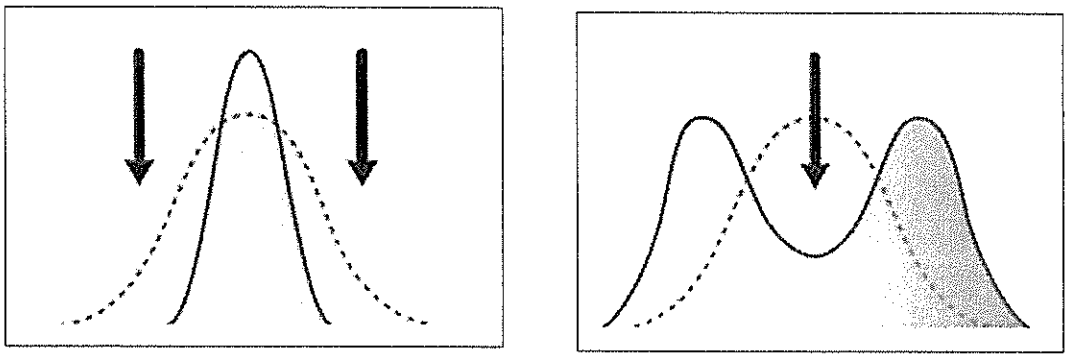
Question 1 [10 marks]

a. **Figure 1** shows two types of natural selection.

i. Name each type of natural selection which is shown in diagram **A** and **B**. (1 mark)

ii. State one example for each type of natural selection shown in **Figure 1**. (1 mark)

iii. Describe the result of natural selection shown in diagram **A**. (1 mark)



A **B**

Figure 1

b. List the four key properties of communities. (2 marks)

c. Define the concept of "Reproductive barriers between species". (1 mark)

d. Briefly describe the following terms in ecology. Give an example for each term.

i. Parasitism

ii. Commensalism

(4 marks)

Continued.....

Question 2 [10 marks]

a. Cellular respiration is a set of metabolic reactions and processes that take place in the cells of organisms to convert energy from nutrients into ATP. During a sporting event an athlete may have to carry out respiration in anaerobic as well as aerobic conditions to produce sufficient ATP.

i. Glucose produced in the liver cell can be released into the blood to maintain blood glucose concentration. Give one use of glucose within the liver cell. (½ mark)

ii. Suggest four reasons why respiration is said to be less efficient in anaerobic conditions than in aerobic conditions. (2 marks)

iii. Explain what happens in the electron transport chain stage of cellular respiration. (2½ marks)

b. The statements below relate to biological molecules. For each statement, give the most appropriate term that matches the description. (2 marks)

i. The molecule formed from a condensation reaction between fructose and glucose.

ii. The name of the bond broken when two amino acids are separated by hydrolysis.

iii. Polysaccharides that form granules in potato tuber cells.

iv. The molecule produced, in addition to fatty acids, when a triglyceride is hydrolysed.

c. Krebs cycle is a sequence of reactions by which most living cells generate energy during the process of aerobic respiration.

i. Where does the Krebs cycle occur in a cell? (½ mark)

ii. What are the end products of Krebs cycle? (1½ mark)

iii. Explain the role of NAD^+ in the Krebs cycle. (1 mark)

Continued.....

Question 3 [10 marks]

a. **Figure 2** shows the photosystem in the thylakoid membrane of a chloroplast.

i. Name the parts labeled **X** and **Y**. (1 mark)

ii. Explain the photoactivation of the photosystem when a photon strikes one pigment molecule. (2 marks)

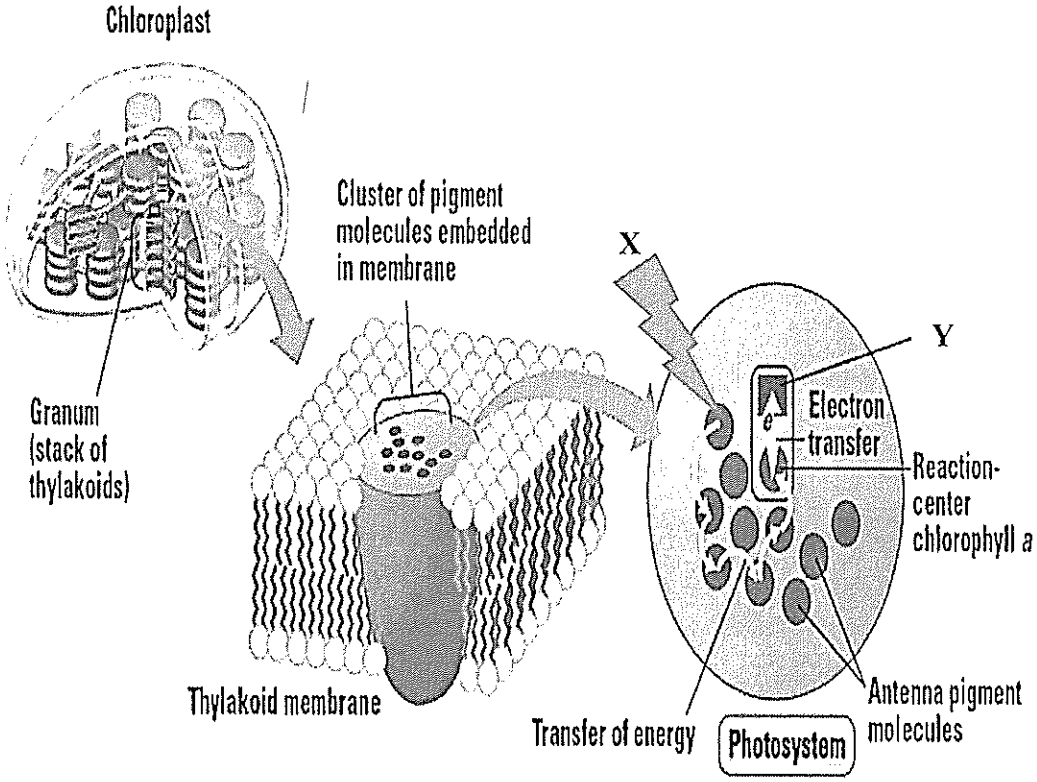


Figure 2

b. Sugar molecules enter cells through transport proteins. Explain why transport proteins are required for the movement of sugar molecules, such as glucose and fructose, into cells. (1 mark)

Continued.....

c. **Figure 3** shows the effect of temperature on the rate of photosynthesis of a plant at low light intensity and high light intensity.

i. With reference to **Figure 3**, what are two deductions that can be made regarding the effect of temperature on the rate of photosynthesis? (1½ mark)

ii. Based on your answer in (i), provide an explanation for each of the two deductions. (1½ mark)

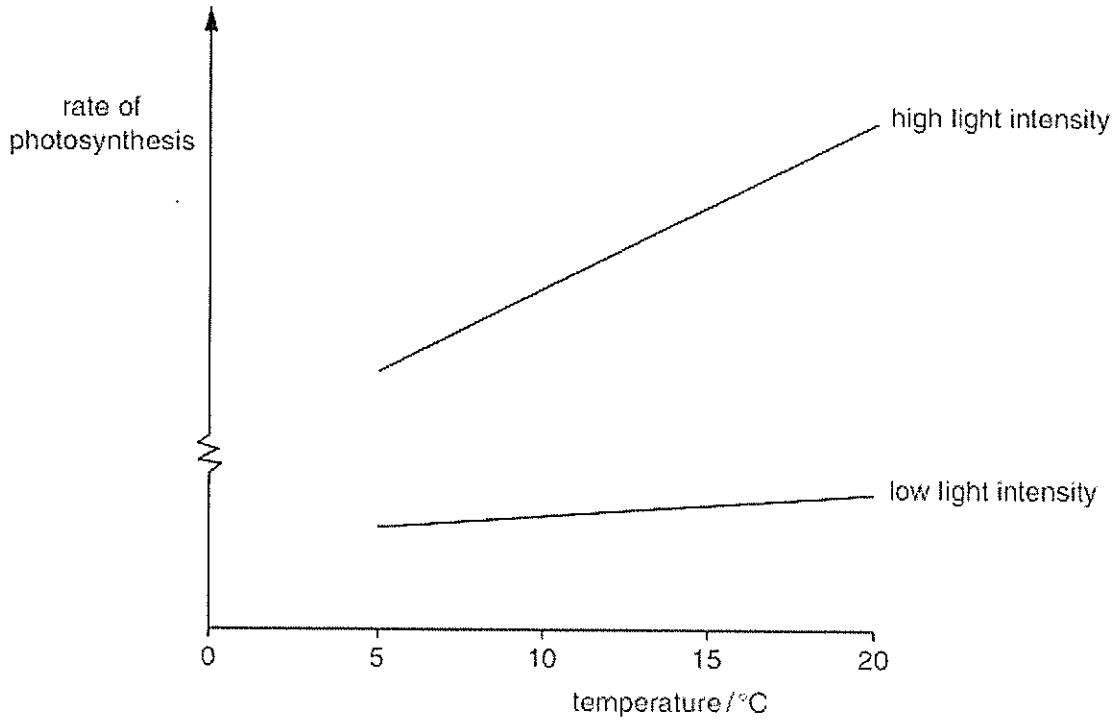


Figure 3

Continued.....

d. **Figure 4** shows a drawing made from an electron micrograph of a longitudinal section of a capillary in muscle tissue. Complete **Table 1** below using the information in **Figure 4**. (3 marks)

	Cell **P**	Cell **Q**	Cell **R**
Name of the cell	i.	iii.	v.
One function of the cell	ii.	iv.	vi.

Table 1

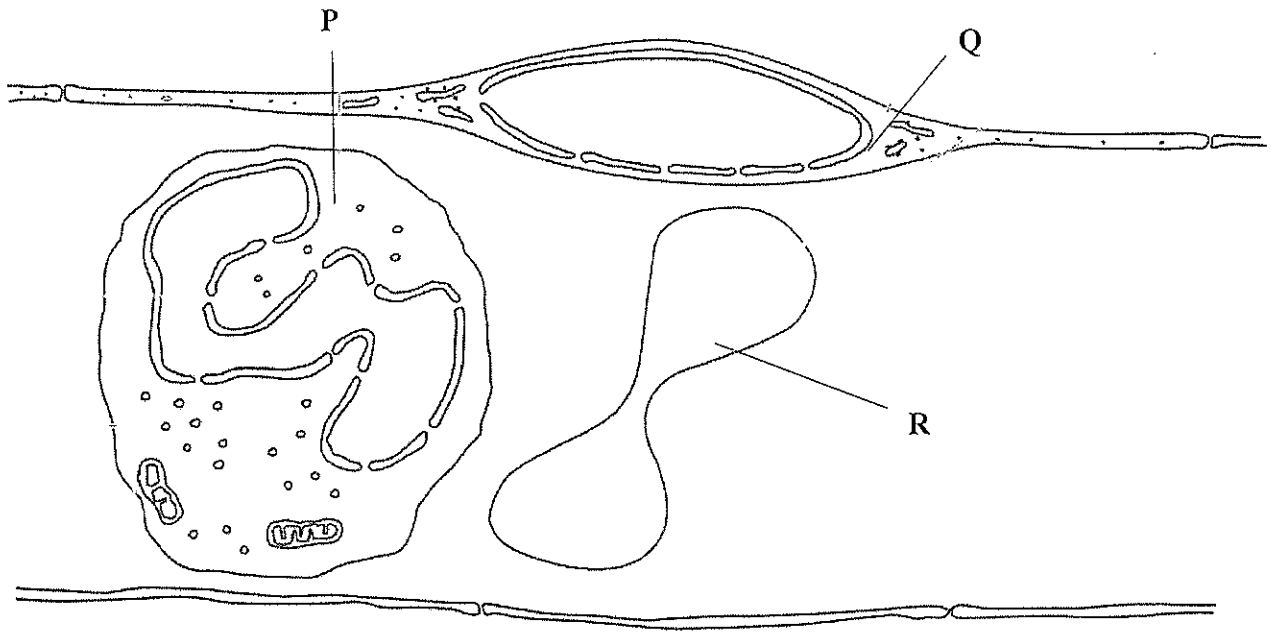


Figure 4

Continued.....

Question 4 [10 marks]

a. The human kidneys process 1200 cm^3 of blood every minute. This 1200 cm^3 of blood contains 700 cm^3 of plasma. As this blood passes through the glomeruli of the kidneys, 125 cm^3 of fluid passes into the Bowman's capsules. This fluid is called the glomerular filtrate and is produced by a process called ultrafiltration.

i. Calculate the percentage of plasma that passes into the renal capsules. Show your working. (1 mark)

ii. Explain why the epithelial cells of the proximal convoluted tubule have many mitochondria in them. (1 mark)

iii. Of the 125 cm^3 of glomerular filtrate that enters the renal capsules each minute, only 45 cm^3 reaches the loops of Henle. Name two substances that are reabsorbed into the blood from the proximal convoluted tubule, apart from water. (1 mark)

b. Explain how an action potential is transmitted along a sensory neurone. (4 marks)

c. **Figure 5** depicts the process of homeostasis that regulates glucose level in blood.

i. Name cell **A** and hormone **Y**. (1 mark)

ii. What will happen in the liver if the blood glucose level falls? (1 mark)

iii. Why is glucose found in the urine of people suffering from diabetes? (1 mark)

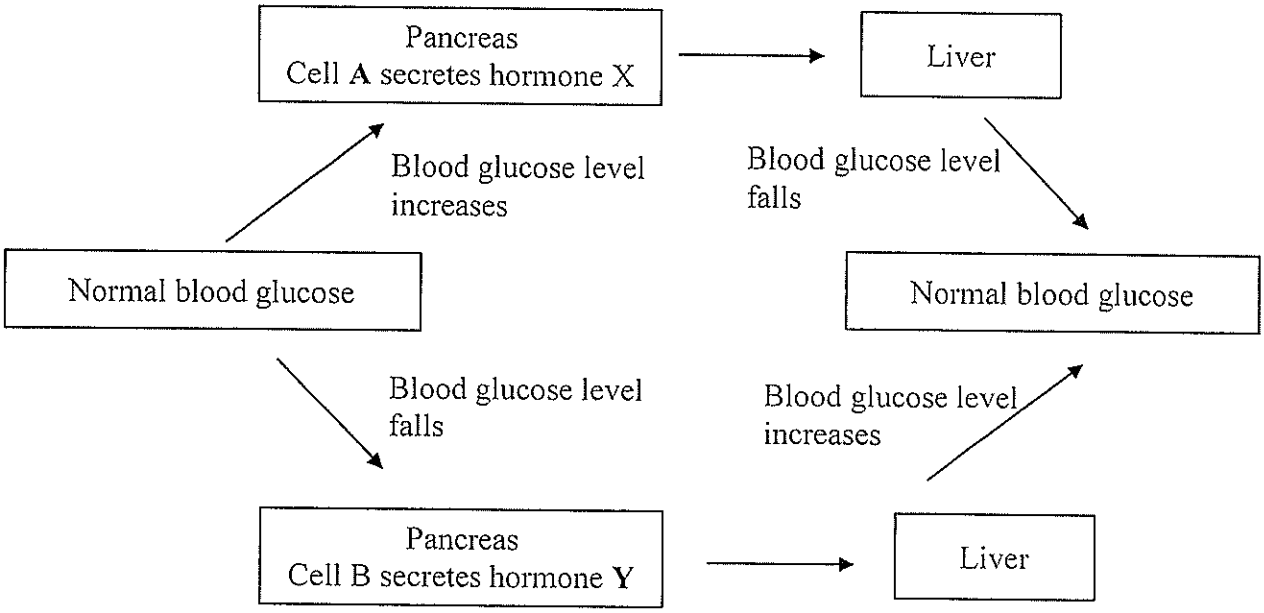


Figure 5

Question 5 [10 marks]

a. **Figure 6** shows the vertical section of the heart. The regions concerned with initiating and conducting impulses have been labeled.

i. Name chamber **P** and blood vessel **Q**. (1 mark)

ii. Explain how the SA node and Purkinje fibers as shown in **Figure 6**, are involved in the initiation and co-ordination of the contraction of the heart. (1 mark)

iii. Explain why the wall around chamber **R** needs to be thicker than that around chamber **P**. (1 mark)

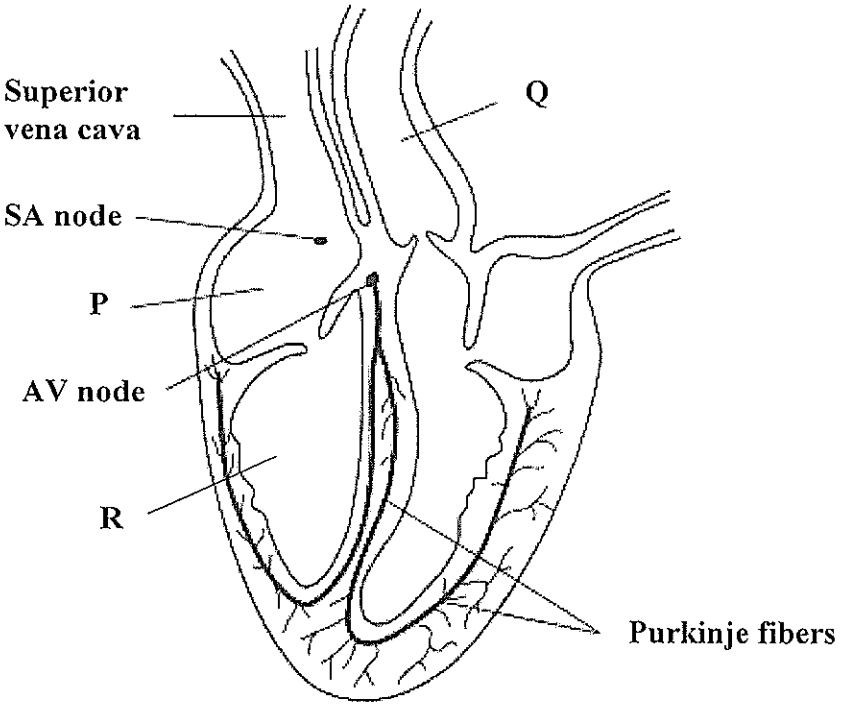


Figure 6

b. When hemoglobin in red blood cells travels through the capillaries of the lungs it binds with oxygen to form oxyhemoglobin. When oxyhemoglobin reaches respiring tissues, it dissociates to release oxygen. When people move to high altitudes there is an increased production of red blood cells. Explain why more red blood cells are produced when people move to higher altitudes. (2 marks)

Continued.....

c. **Figure 7** shows the mechanism of hormonal action.

i. Name the parts labeled **A**, **B**, **R** and **S**. (2 marks)

ii. Explain the mechanism of action of Hormone **A** in **Figure 7**. (3 marks)

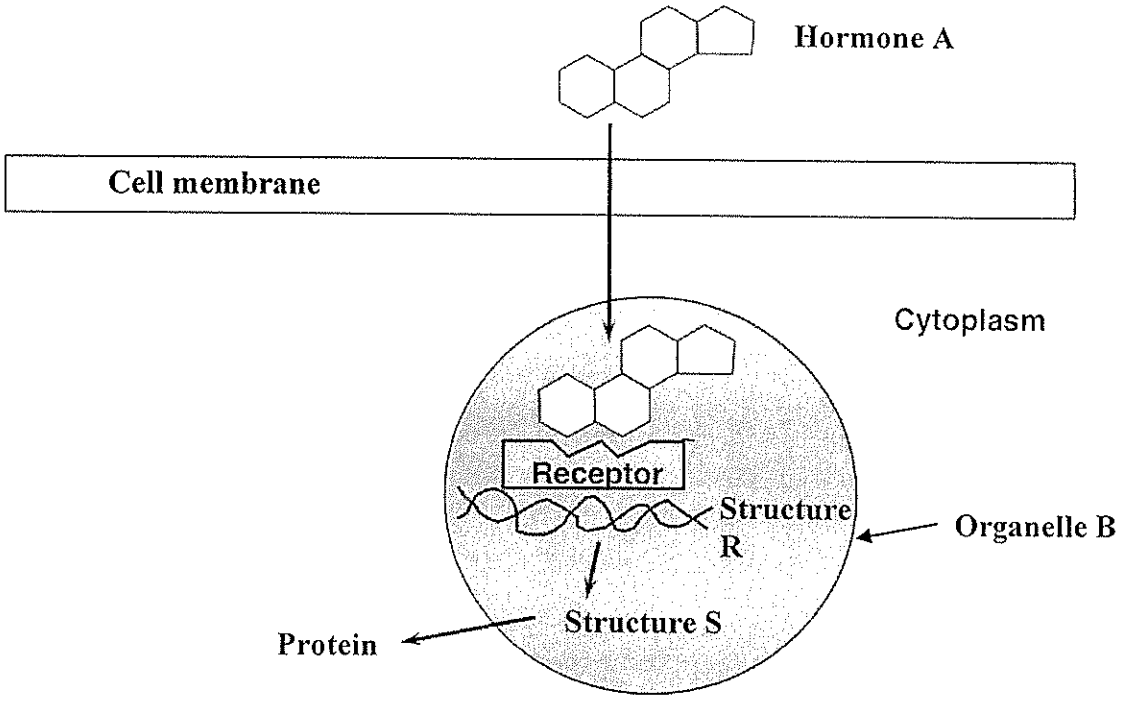


Figure 7

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